REMARKS

Applicants have amended their claims in order to further clarify the definition of various aspects of the present invention. Specifically, Applicants have amended claim 1 to incorporate therein the subject matter of claim 15; and, in light thereof, have cancelled claim 15 without prejudice or disclaimer. Applicants have amended claims 3 and 5 to set forth proper Markush language, and have amended claims 4, 10, 13, 14 and 18 to correct typographical and grammatical errors.

Moreover, Applicants are adding new claims 19-22 to the application. Claim 19, dependent on claim 1, recites that the active hydrogen-containing compound includes at least three active hydrogen atoms; and claim 20, also dependent on claim 1, defines a ratio of isocyanate groups in the organic polyisocyanate compound to total number of OH groups and amino groups in the active hydrogen-containing compound. Claims 21 and 22, each dependent on claim 1, respectively recites a thickness of the coating layer, and recites that the skeletal structure represented by Formula (1), contained in the coating layer, accounts for at least 48% by weight thereof.

In connection with the newly added claims, note, for example, pages 13, 23, 26 and 34, of Applicants' specification.

Applicants respectfully submit that all of the claims presented for consideration by the Examiner patentably distinguish over the teachings of the prior art applied by the Examiner in rejecting claims in the Office Action mailed July 3, 2006, that is, the teachings of the U.S. patent documents to Hata, et al., No. 6,033,749, to Strassel, No. 3,475,266, to Toyota, et al., No. 6,815,467, and to Ramanathan, et al., Application Publication No. 2003/0044553, under the provisions of 35 USC 103.

It is respectfully submitted that these references as applied by the Examiner would have neither taught nor would have suggested such a fuel system as in the present claims, including, inter alia, a coating layer formed on the surfaces of at least one side of at least one of a fuel vessel body, a molded part body for a fuel and a tube body for a fuel or at least one of connected parts in these bodies, wherein the coating layer is formed by coating an urethane resin composition comprising an active hydrogen-containing compound (A) and an organic polyisocyanate compound (B), the coating layer having specified gasoline permeability coefficient, and wherein a skeletal structure represented by Formula (1), contained in the coating layer formed by coating the urethane resin composition, accounts for at least 20% by weight. See claim 1.

As will be shown further in the following, it is respectfully submitted that these applied references do not disclose, nor would have suggested, the fuel system including, inter alia, the coating layer having specified amounts of the skeletal structure represented by Formula (1), and advantages due thereto.

Furthermore, it is respectfully submitted that these references would have neither disclosed nor would have suggested such fuel system as in the present claims, having features as discussed previously in connection with claim 1, and, moreover, wherein such skeletal structure represented by Formula (1) accounts for at least 48% by weight (see claim 22); and/or wherein the organic polyisocyanate compound (B) comprises a reaction product of (a) and (b), or a reaction product of (a), (b) and (c), as described in claim 12, especially wherein the polyfunctional isocyanate compound includes at least one compound selected from xylylenediisocyanate and derivatives thereof (see claim 13), in particular, wherein the polyfunctional isocyanate compound includes xylylenediisocyanate (see claim 14);

and/or wherein the urethane resin composition has a ratio of isocyanate groups in the organic polyisocyanate compound to the seem of OH and amino groups in the active hydrogen-containing compound as in claim 20.

Moreover, it is respectfully submitted that these references would have neither taught nor would have suggested such fuel system as in the present claims, having features as discussed above in connection with claim 1, and, moreover, wherein the thermoplastic resin is at least one selected from those set forth in claims 3-6; and/or wherein the active hydrogen-containing compound (A) utilized in forming the coating layer has at least 3 active hydrogen atoms (see claim 19), and/or includes at least one compound as set forth in claims 7-11.

Furthermore, it is respectfully submitted that the teachings of the applied prior art would have neither disclosed nor would have suggested such fuel system as in the present claims, having features as discussed previously in connection with claim 1, and having additional features as in the remaining, dependent claims, including (but not limited to) wherein the gasoline permeability coefficient is that set forth in claim 2; and/or wherein the coating layer is formed on any surface of the inside and outside of the fuel vessel body at an area rate of 50-100% (see claim 16); and/or wherein the fuel system includes the fuel vessel with the coating layer formed on any surface of the inside and outside of the molded parts for a fuel (see claim 17), or formed on at least one of connected parts of the fuel vessel and the molded parts for a fuel (see claim 18); and/or wherein the coating layer has a thickness of 1-200 μm (see claim 21).

The present invention relates to a fuel system comprising various parts, excellent in, inter alia, permeation-preventing performance against an automobile fuel (that is, having a gasoline barrier property), heat resistance and impact resistance.

Recently, attention has turned to forming fuel vessels of a thermoplastic resin, in view of a reduction in weight, rust preventive property, ease in mold processing and recycling ability, in comparison with metal-made fuel vessels. However, there has been a problem that previous single-layer fuel vessels, made, for example, of polyethylene, have a relatively high gasoline permeability, so that gasoline is permeated and volatilized through the fuel vessel body. It has been proposed to provide a multilayer tank comprising, for example, polyethylene and an ethylene-vinyl alcohol copolymer; however, in view of recent environmental regulations, the gasoline barrier property thereof is not necessarily satisfactory. Furthermore, in making such multi-layer structures, problems arise in connection with forming a layer of a fuel-barrier material on, e.g., polyethylene, as described, for example, on pages 2-4 of Applicants' specification.

Against this background, and as a result of intensive investigations by the present inventors, Applicants provide a fuel system including a coating layer on at least one of a thermoplastic resin and a synthetic rubber, excellent in a gasoline barrier property, a heat fusing property and mechanical strength, wherein the coating layer can be formed evenly (so as to provide excellent gas-barrier properties, even in light of present environmental laws), and which has good adhesion between the coating layer and fuel vessel body and wherein the fuel system has good flexibility and bending resistance. Applicants have found that by utilizing a coating layer as in the present claims, formed by curing an urethane resin composition comprising an active hydrogen-containing compound (A) and an organic polyisocyanate compound (B), and wherein a skeletal structure represented by Formula (1), contained in the coating layer formed by curing the urethane resin composition, accounts for at least 20% by weight thereof, objectives according to the present invention are achieved. That is, as described in the paragraph bridging pages 22 and 23 of Applicants' specification, when the cured resin contains the backbone structure represented by Formula (1) in an amount of 20% by weight or higher, a high gasoline-barrier property can be exhibited, a still higher capability of preventing leakage of gasoline from the coating layer is achieved, and a good adhesion property between the fuel vessel body and molding parts or tube is achieved. Note also the second full paragraph on page 29 of Applicants' specification. As to advantages achieved by the present invention, note the Examples in Applicants' original disclosure, starting from page 33 thereof; and note especially Tables 1 and 2 respectively on pages 35 and 37 of Applicants' specification.

Hata, et al. discloses an automobile fuel tank of multilayer construction, which includes (a) inner and outer layers of high-density polyethylene; (b) intermediate layers of adhesive resin; and (c) a core layer of ethylene-vinyl alcohol copolymer, wherein the total thickness of layers positioned inside the layer (c) is smaller than the total thickness of the layers positioned outside of the layer (c). See column 1, lines 8-11, and from column 1, line 66 through column 2, line 7. Note also column 2, lines 19-26, 49 and 50; and column 3, lines 4, 5, 16-22, 27-30 and 36-43. See also column 5, lines 9-12 and 22-25.

It is respectfully submitted that Hata, et al. discloses fuel tank structure including, inter alia, a layer of ethylene-vinyl alcohol copolymer, and it is deficient in connection with presently claimed structure, with respect to inter alia, a coating layer as in the present claims, and advantages thereof.

It is respectfully submitted that the additional teachings of the secondary references applied by the Examiner would not have rectified the deficiencies of Hata, et al., such that the presently claimed invention as a whole would have been obvious to one of ordinary skill in the art.

Strassel discloses polyether-polyurethane-polyurea compositions intended to be used for spraying onto a support, obtained by contacting a polyether-polyurethane prepolymer, previously prepared by reaction of polyether polyols with such a stoichiometric excess of polyisocyanates that the ratio NCO/OH in the prepolymer is from 1.5-3, with a diamine dissolved in a volatile solvent, the proportion of polyether-polyurethane prepolymer and of the diamine being defined. Note the paragraph bridging columns 1 and 2 of this patent. This patent goes on to disclose that the articles obtained may be used for the manufacture of footwear soles, carpets for the automobile industry, decorative boards for walls and the like, and floor coverings and the like. See, for example, column 4, lines 48-51. See also column 5, lines 17-20.

Initially, it is respectfully submitted that the teachings of Strassel are not properly combinable with the teachings of Hata, et al., as applied by the Examiner. Thus, note that Hata, et al. is directed to a fuel tank, having required essential features of, e.g., a barrier for the fuel. Strassel discloses polyether-polyurethane-polyurea compositions, used, for example, for protective and decorative coatings (note, for example, column 1, lines 47-50, of Strassel). It is respectfully submitted that one of ordinary skill in the art concerned with in Hata, et al. would not have looked to the teachings of Strassel, as applied by the Examiner.

While Strassel discloses formation of specified coatings, it is respectfully submitted that this patent provides no disclosure or suggestion, either alone or in combination with the teachings of Hata, et al., of use of the compositions thereof in a fuel tank as in Hata, et al. It is respectfully submitted that only through hindsight use of Applicants' original disclosure, which of course is improper under the requirements of 35 USC 103, would one of ordinary skill in the art have looked to the compositions of Strassel in connection with the fuel tank of Hata, et al. It is emphasized that such hindsight use of Applicants' original disclosure is improper, under 35 USC 103.

Furthermore, it is respectfully submitted that there would have been no motivation for combining the teachings of Strassel with the teachings of Hata, et al., as applied by the Examiner, absent hindsight use of Applicants' original disclosure, which hindsight use is improper under the requirements of 35 USC 103.

Noting that claim 15 has been rejected utilizing the additional teachings of Toyota, et al. (see Item 4 on pages 4-6 of the Office Action mailed July 3, 2006), this reference discloses methods for producing a polyoxyalkylene polyol and a polymer dispersed polyol, the method for producing the polyoxyalkylene polyol being described most generally in column 2, lines 45-65. Note also column 7 of this patent, disclosing that the polyol and the polymer dispersed polyol are widely used as a material of a flexible foam, an elastomer, a synthetic resin, a coating and a sealing material, or as a surfactant, a lubricant, a diluent, a plasticizer, etc. Note column 7, lines 39-47. See also column 9, lines 39-43.

It is respectfully submitted that the teachings of Toyota, et al. would not have been properly combinable with the teachings of Hata, et al. and of Strassel, as applied by the Examiner. Thus, it is emphasized that Toyota, et al. is concerned with providing a specified polyol and polymer dispersed polyol, useful, for example, as a flexible foam, being disclosed as useful as, e.g., a cushion, a mattress or a seat, particularly suitable as a seat for vehicles such as automobiles (note again column 9, lines 39-43, of Toyota, et al.). Noting the relatively harsh conditions of a fuel tank, including contact with fuel (e.g., gasoline), it is respectfully submitted that one of ordinary skill in the art concerned with in Hata, et al. would not have looked to the teachings of Toyota, et al. That is, these references are directed to non-analogous arts.

In any event, again noting the different structures described in Hata, et al. and in Toyota, et al., it is respectfully submitted that there would have been no motivation for combining the teachings of Hata, et al. and of Toyota, et al., as applied by the Examiner, even in light of the teachings of Strassel, absent hindsight use of Applicants' disclosure, which use of course is improper under the guidelines of 35 USC 103.

In any event, even assuming, arguendo, that the teachings of Hata, et al., Strassel and Toyota, et al., as applied by the Examiner, were properly combinable, it is respectfully submitted that the combined teachings of these references would have neither disclosed nor would have suggested the presently claimed structure, including wherein the skeletal structure represented by Formula (1) is contained in the coating layer in an amount accounting for 20% by weight or more, and advantages thereof as discussed in the foregoing.

The Examiner has referenced Toyota, et al. at column 14, lines 60-65, as teaching a urethane comprising an active hydrogen-containing compound including an alkyleneoxide adduct of xylylenediamine in which the alkyleneoxide has 2-4 carbon atoms (the Examiner also referring to column 8, lines 66-67, and column 9, lines 12-14). Column 14, lines 60-65, of Toyota, et al. discloses a flexible polyurethane foam. Moreover, the portions of columns 8 and 9 referred to by the Examiner list examples (that is, many examples) of functional groups having active hydrogen. It is respectfully submitted that such teachings of Toyota, et al., particularly noting the uses of the polyol and polymer dispersed polyol of Toyota, et al., even in light of the teachings of Hata, et al., would not have led one to combine the teachings of Toyota, et al. with Hata, et al., with or without the teachings of Strassel, and, more particularly, would have neither disclosed nor would have suggested such fuel system as in the present claims, having the coating layer of the present claims, and advantages thereof as discussed in the foregoing.

In connection with claims 5 and 6, and noting the rejection set forth in Item 3 on pages 3 and 4 of the Office Action mailed July 3, 2006, Ramanathan, et al. discloses a fuel tank including two or more sections bonded together by means of an adhesive which has a fuel barrier property and which bonds to low energy surface materials, as described in paragraph [0016] on page 1 of this patent document. Note also paragraph [0001] on page 1. Note, further, paragraph [0031] on page 2, disclosing polymers having fuel barrier properties which can be employed in the fuel tank described in this patent document. Note also paragraph [0036] on page 3, disclosing preferred adhesives.

Even assuming, arguendo, that the teachings of Ramanathan, et al. were properly combinable with the teachings of Hata, et al. and Strassel, with or without the teachings of Toyota, et al., such combined teachings would have neither disclosed nor would have suggested the presently claimed fuel system, including, inter alia, the coating layer as in the present claims, having the specified skeletal structure in the specified amount.

In view of the foregoing comments and amendments, reconsideration and allowance of all claims presently in the application are respectfully requested.

Applicants request any shortage in fees due in connection with the filing of this paper be charged to the Deposit Account of Antonelli, Terry, Stout & Kraus, LLP, Deposit Account No. 01-2135 (case 396.43174X00), and credit any excess payment of fees to such Deposit Account.

Respectfully submitted,

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